

October 15, 1963

Dr. N. E. Gibbons
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Ottawa 2, Canada

Dear Dr. Gibbons:

Thank you for your communication of September 26 relative to the action of the IAMS soliciting appraisals of the problem of planetary contamination. You are probably already well acquainted with my own position on this subject and I have not lacked for an opportunity to make it known to COSPAR and to national agencies involved in space research. There are just two points that I would like to stress in the general picture:

1) Astronomical determinations of the parameters of the Mars surface are subject to a large uncertainty, unknown in direction and quantity. We should be cautious about relying on assertions as to the best estimates of temperature, water concentration, and other parameters which are likely to suffer considerable local variation. The only way I have been able to assimilate all of the considerations is to establish some number as representing the equivalent damages of unwanted contamination and then to multiply this cost by a series of factors representing our best estimates of the probability of an undesired result. For example, if one were to conclude that there was a residual likelihood of the order of .01 that Mars had resources of water readily available to organisms, then this consideration would possibly lead to a reduction of the "equivalent cost" (expected value) by the same factor, .01, provided this was a necessary condition for the liability of damages by contamination. The same sort of factors must be considered in assessing the likelihood of failure of sterilization, the likelihood that an organism would survive impact, that given other factors it would be able to proliferate, etc. Our course of action would then be based on a prudent and to some extent calculable balance between our assessment of the values at risk, on the one hand, and the possibilities of prejudicing these values on the other.

2) It has usually been taken for granted that the disturbance of existing life was the main "value" which was at risk in planetary contamination. While I would certainly place a very high priority on this consideration, it should not obscure others. For example, even if Mars were now sterile, but were habitable by terrestrial microorganisms, I submit we should still be extremely cautious in our exploration. The introduction of terrestrial life to such a habitat would be bound to lead to very large perturbations of planetary chemistry, of a character which is unpredictable both in itself and with respect to the presently unforeseeable utilization of planetary resources that future technology may bring about. If we bring terrestrial life to Mars

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and it can survive there, I believe it should be a matter of deliberate forethought as to the projected consequences rather than an inadvertence arising out of our momentary impatience.

I am not sure precisely which documents Dr. Kellogg has furnished, although I am familiar with many of his writings and have great respect for his authoritative position in this field. I would urge you to bring to the attention of your correspondents the considerations which are summarized in the enclosed note. If these copies are not sufficient I will be happy to furnish more of them.

Sincerely yours,

Joshua Lederberg
Professor of Genetics

Enclosure: 30 copies of
Lederberg, J. and C. Sagan, 1962. Microenvironments for life
on Mars. Proc. Nat. Acad. Sci. 48: 1473-75.